

THE PLACE OF THE NATIVE PERSIMMON IN NATURE.

IN RELATION TO OTHER PLANT COMMUNITIES AND TO CERTAIN ECONOMIC INSECTS.*†

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INTRODUCTION.

The economic value of the native persimmon, *Diospyros virginiana* L., is limited although it finds uses in several different ways. Its real values are in the ebony-like character of its wood, in the nectar produced by the flowers and in the stock it supplies for Japanese persimmon grafting scions. Some mistletoe is collected from the larger trees and sold during the holiday season. The greatest potential value is undoubtedly in the undeveloped and non-commercialized fruits.

The wood is used where a very hard material is necessary as in shuttles, golf stick heads and plane stocks. When the timber was cut along the railroads in the Carolinas large amounts of this wood were used in the mills. The use in recent years, however, is much less, not because it is not as valuable and could not be used in many more ways than formerly, but because of the sub-dominant position it has in nature which limits the supply so that milling for it is not profitable.

A very fine quality of honey is made from the nectar produced by the flowers. It has been rated as the fourth plant in the quantity of nectar produced in the Coastal and Piedmont Sections of North Carolina and probably ranks about the same in South Carolina. In the Mountain Section it is less common but still is one of the important nectar producing plants.

The native persimmon is the common stock now used for grafting of the Japanese persimmon scions. The small seedlings which grow almost everywhere supply an abundance of material for this use.

*A portion of this study was made when the writer was located at N. C. State College and the remainder since going to Clemson College, S. C.

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It is not generally known that the food value of the fruit is next to that of the date and that the flavor of the ripe non-astringent varieties is very excellent. The fruit is used chiefly by negroes, hogs and opossums. The prejudice against the astringent and unripe fruit seems to be extended to all the varieties and even to the Japanese persimmons.

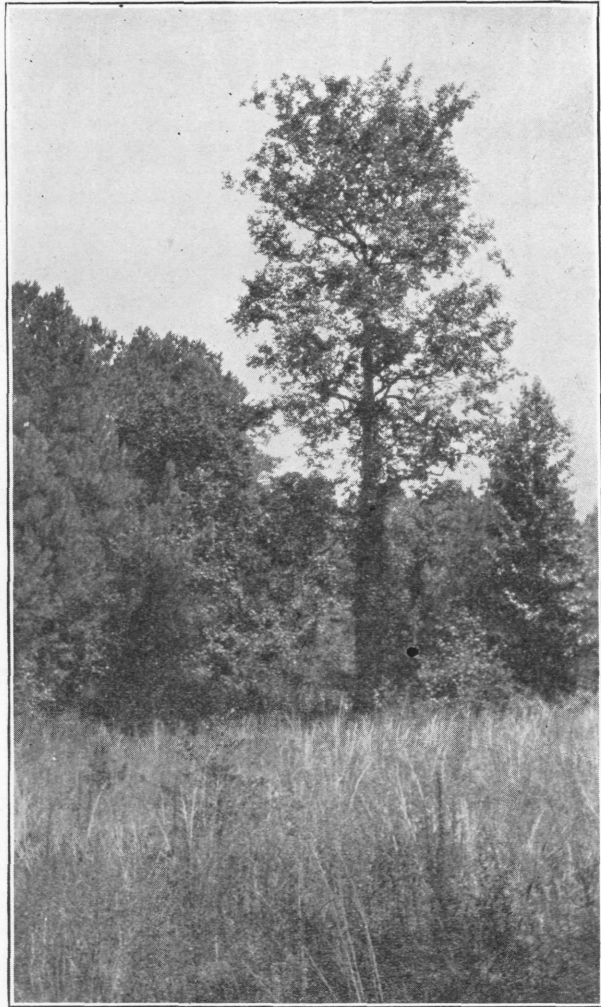


FIGURE 1

RELATION TO OTHER PLANT COMMUNITIES.

The persimmon grows or starts to grow in many diverse habitats but it does not occur in large numbers in any of these after it reaches maturity as do pine, oak and many other trees.

In the rich flood plains of the river valleys the persimmon reaches the maximum size. In the lower Mississippi River valley trees may be found that are 115 feet high, that are 70 or 80 feet to the lowest branches and that have a diameter of six feet or more. In the most favorable habitats of the middle and inner Coastal Section of the Carolinas, the tree rarely exceeds 50 or 60 feet in height and a diameter of 18 inches. A few are larger. The usual type of upland tree in the Carolinas seems to be from 30 to 40 feet in height and eight to twelve inches in diameter.

The persimmon is smaller as the elevation increases, so large trees are not common in the Mountain Section. Small trees and shrubs, however, were seen as high as 2500 feet elevation around Ashville, N. C. and at 3500 feet when preceded by cultivation.

The chief environments are not always the same in different parts of the Carolinas and may be found more variable when studies made in larger areas are reported. In certain areas it is found more commonly on the flood plains or near the margins of swamps as in certain portions of the central and eastern Carolinas. In other areas the upland environments are the most common as in the western part of these states.

The persimmon grows abundantly as shrubby compact growth or as small trees, more or less scattered around the edge of alder swamps. It is sometimes found alone in these situations but red maple (*Acer rubrum* L.) is often found with it. Each species may occur in separate groups spaced about the margin of the alder swamp or they may be very generally mixed together. Sometimes it may be mixed with willow (*Salix* sp?) although when willow occurs in any quantity it usually precedes it.

In case of a gradual drying or maturing of the alder swamps the persimmon is often found in the alder area sometimes as scattered small trees or even in clumps in the higher areas.

The loblolly pine (*Pinus taeda* L.) and the yellow pine (*Pinus echinata* Mill.) enter as a part of many successions in a large portion of the Carolinas but they are not usually seen

near an alder swamp unless it is near a slope. In that case the pine may grow up to and even into the alders on that side. In case the persimmon has followed the alders on the slope side it will be shaded out by the pine.

On the stream side of the alder swamp willow may succeed the alder, to be followed by persimmon, red maple and sometimes blackberry and smilax for a time. This seems to be one of the situations that allows some trees to attain maximum size since the dominant trees of the flood plain do not always crowd it as much as do the pine from the slope side. Groups of small and medium sized persimmon trees are often seen near the alder swamps that are rapidly drying. Those nearest the swamp are usually the smallest indicating that the swamp is decreasing in size. Grass often starts around these groups of trees and when pasturing follows there is very little then to hinder further growth. But even in these situations the persimmon is only a subdominant species, so in spite of the large numbers that start, but few large trees are ever found and these are not commonly together. In one situation noticed three years ago persimmon was grouped around alder on a stream bank, but both are now dying out under the more vigorous growth of tulip and other deciduous trees.

In some areas of the western Carolinas the persimmon grows around the groups of mountain laurel when it is growing on the banks of rapidly flowing streams. Both deciduous and evergreen trees usually grow very close to these openings, however, so the persimmon never becomes very large.

The way the native persimmon occurs around the swamps containing *Cornus stricta* seems to be very similar to the alder swamp relationship.

The persimmon often enters successions after *Andropogon*, *Erigerion* or *Syntherisma* with pine. However, it is never found with pine after they attain maturity so it appears that the pine growth being more rapid shades the persimmon out. The persimmon is sometimes in these situations without pine, but it is not supposed that it will ever be long before the pine does enter, since a group of them never attains large size.

The persimmon is a common undergrowth in both the loblolly and yellow pine forests, provided the shade be not too dense. However, it gradually dies out as the light requirement increases unless an opening occurs in the pine, in which case, trees of moderate size sometimes develop. If the pine are too

thick and the shade very dense few or no seedlings of the persimmon start. If the pine growth be very open many other shrubs or seedlings (including oaks and Liquidambar) will start and no persimmon will be found.

If a growth of pine, either loblolly or yellow, which has much of the shrubby growth in it be cut, as often occurs, some of the smaller persimmon is usually left. This gives these seedlings an opportunity for growth since they are now unhindered by the pine seedlings which, although they start very soon along with blackberry, *Ergerion* and other weeds, are not eliminative factors for some years. The pine stumps and roots decay rapidly and in a few years the ground may be cleared, very easily, of pine seedlings and rotten stumps. The persimmon meanwhile has grown to some size and is doubtless not all eliminated in the clean up as cultivation proceeds around many trees in fields that have had this history. In case all of the persimmon trees and seedlings are cut in clearing land for cultivation it is a persistent grower coming up year after year from the roots, after all other trees or shrubs are dead. Even fires do not usually kill the roots. Early growth from roots is rapid and unless the grower is persistent these will develop to fruiting trees and thus this serves as another source of the trees of moderate size scattered over cultivated fields.

One of the first trees to be found on much washed and barren areas is the persimmon. It often starts here and grows for years before weeds, *Andropogon* or trees other than the persimmon do, and often attains size large enough to produce fruit.

The persimmon starts in many places other than those noted above. A few of these will be mentioned without any discussion. It is one of the common roadside shrubs and frequently a tree will be found that has developed from this situation. It starts commonly along railroads and even between the ties. It grows abundantly as a shrub on exposed banks as along railroad or highway cuts and fills. Oak, pine, cherry or other seedling may or may not occur along with it.

Small trees or shrubs of the persimmon are sometimes found growing on the banks of small streams, like red maple or tulip, in which case, alder and willow may not have preceded them. It also grows in small numbers successfully and to a large size sometimes along the edge of the narrow strip of

densely wooded area that borders the rivers of North Carolina and South Carolina.

A few places have been observed where the persimmon does not grow or at least it occurs uncommonly. It does not occur in the sand dunes of the eastern coast except in rare cases, where more mesophytic conditions than usual exist. It does not grow commonly as a tree in the Savannahs nor in the long leaf pine areas. In these situations it sometimes occurs as a margin shrub or small tree along roads and improved areas. It is not found in the scrub oak region of the Sand Hill section except as a small margin growth or in low ground where more mesophytic conditions exist and then it rarely becomes very large.

A HOST AND RESERVOIR FOR CERTAIN DESTRUCTIVE INSECTS.

The culture of the Japanese persimmon and the native persimmon for their fruits and the native persimmon as a stock for Japanese persimmon scions has been encouraged, in part, because of their apparent freedom from insect pests. Some studies, made by the writer, of the insects affecting these trees show that both the Japanese persimmon and the native persimmon are less subject to insect damage than the majority of fruit trees but also that several species of insects bear important relationships to them.

The native persimmon is attacked chiefly by leaf eaters, leaf-sucking insects, borers and scale insects. No insect pests of the fruit have been noted in the Carolinas. One gall forming mite is abundant. In this paper, however, only insects that are common on the native persimmon and that bear important relationships to other economic plants are considered. Since very little information has been reported concerning the persimmon psylla, the most characteristic pest of the native persimmon and the Japanese persimmon as well, a brief discussion of it is included.

THE PERSIMMON PSYLLA.

The persimmon psylla, *Trioza diospyri* Ashmead, (a Homopterous sucking insect), attacks the native persimmon and the Japanese persimmon chiefly when the insect is in the nymphal stage. The feeding of the adults rarely causes apparent damage. The largest numbers of the insects and the maximum

damage occur in the spring and summer when the leaves are young and growing, before control by the parasites and predators has become effective and while the female psyllas are laying the largest number of eggs. During late summer and fall one rarely finds this insect in numbers on the Japanese persimmon. It also becomes most uncommon on the native persimmon. At this time, it is found only on the young shrubby growth where some of the leaves are still young and growing. The injury on larger trees where growth is not succulent is never great.

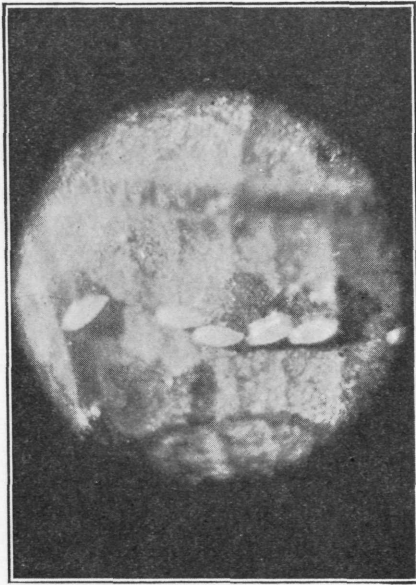


FIGURE 2

Development and Description.

The persimmon psylla, occurs in three different stages: i.e., the egg (Fig. 2), the nymph or developing young (Fig. 3), and the adult. The latter, when mature, is a shiny black insect about 2.5 millimeters long with transparent wings raised vertically over its body when at rest and having one ivory white line on either side of the abdomen anteriorally. They appear somewhat like graceful aphids but, unlike them, have the habit of jumping quickly.

Females that emerged in the insectary on known dates lived from 6 to 39 days with an average of 16.8 days. They laid eggs in from two to nine days after emergence. The maximum number of eggs laid by one female on test was 1,173. The average number of eggs laid by the females of an early generation was 230.5; by a later generation, 173.6 and by a mid-summer generation 37.

The preoviposition period of 311 females averaged 5 days. Mating usually occurs a number of times at varied intervals beginning within a day or two after the females emerged. The male walks up beside the female, the posterior end of the abdomen curves around to the female and copulation takes place while they stand beside each other.

The elongate-ovate eggs of the persimmon psylla are found lying flat on the succulent growth of the persimmon. They are about .01 inch in length with the larger end curved down and attached while a short pointed portion curves away from the support at the smaller end. The eggs are pale white, turning to yellow or brownish yellow before hatching. They are laid singly, usually rather uniformly arranged in rows along the margin of the leaf, on the surface of the leaf, or on the petiole or stem. They may also be found very generally scattered over these areas. Sometimes they are found scattered or grouped in the axils of the leaves or around dormant buds.

The period of incubation of 36,770 eggs laid by ninety-nine females of three generations during the period from May 28, 1926 to July 16, 1926 averaged 8.6 days with a maximum of 15 days and a minimum of 4 days.

In the early stages the nymphs are minute, elongate, rounded insects usually clear white in color (occasionally a brownish red) with very few spines. The older nymphs are much flattened and strongly fringed (Fig. 3). They cling very tightly to the leaf in such a way that it is very difficult for other insects to attack the soft ventral surface of the abdomen. In the last instar the nymphs assume a bluish color. They are usually protected inside folds of the leaves.

The nymphs excrete a watery fluid, as do aphids, which is enclosed in a thin membrane. The mass is cylindrical in form when issuing from the psylla nymphs and may remain so, or it may coil somewhat as a watch spring, or break up into globular masses. These excretions are gradually shaken from the folds of the leaves, where many nymphs develop, by wind

or other disturbances. When the nymphs are in exposed positions they fall directly to the ground. The leaves are thus not soiled by the excretions and fungous diseases have not the opportunity to grow as they do in excretions from aphids. It seems that this adaptation may be correlated with the formation of the leaf rolls. Were it not for this adaptation

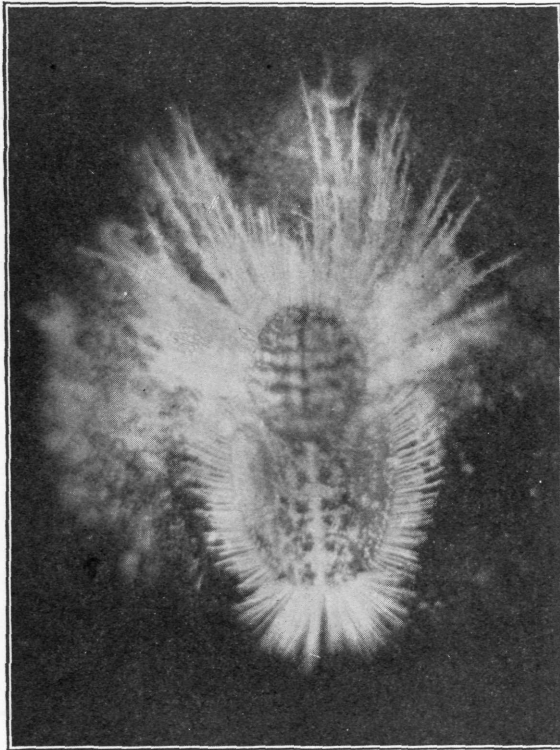


FIGURE 3

these leaf rolls would be filled with a mass of sweetened, sticky excretions that would probably very soon render them unfit for use by the insect.

When the nymphs are ready to transform they crawl to an exposed surface, usually on the leaves, and the adult insect emerges through a dorsal longitudinal slit in the head and thorax. The newly emerged adult is greenish in color.

Habits and Damage.

The nymphs may be found on practically all the growing leaves of the native and the Japanese persimmon since the shape of these leaves can be modified. One generation of nymphs is usually all that develops on one leaf as the leaves are then older and are not modified by the insect.

The nymphs are usually found on the lower surface of the growing leaves of the native persimmon near the margin with the edge folded or rolled more or less tightly over them (Fig. 4). Sometimes they occur on the upper surface of the leaves with the edges turned up over them. A few are found on the upper surface of the leaves near the tip of the mid-veins with each side of the leaves raised vertically and tightly enclosing the insects. Occasionally they are found scattered over the leaves generally. Some cling tightly to the sides of the veins.

On the Japanese persimmon these insects rarely form folds but they do produce indentations or pits on the lower surface of the leaves. They do not stay on the Japanese persimmon as long each year as they do on the native persimmon.

Most of the damage to the native persimmon is in the stunting of growth because most of the leaf folds straighten and recover, very largely, after the nymphs transform to adults. Some permanent mechanical injury occurs sometimes when the number of nymphs in one fold is very great. At times the leaves are so severely injured they curl, wilt, die and fall from the tree. A few cases have been seen where the growing tips of the branches were killed.

The damage caused by this pest to the Japanese persimmon is also chiefly in the stunting of growth since the change the insect causes to the leaves is usually slight and recovery is rapid after they become adults.

Natural Control.

The persimmon psylla is preyed upon by the larvæ of the syrphid, *Allograpta obliqua* Say, which usually pry up the body of the nymphs, puncture the ventral abdominal surface and suck the body fluids. This syrphid has been very abundant the last few years during the early summer.

The control of the nymphs of the persimmon psylla by an internal parasite, *Psyllaephagus trioziphagus* (How.), becomes highly effective during the late summer. This parasite, how-

ever, is rarely found during the early part of the season. Several species of ladybird beetles (larvæ and adults) are also commonly predaceous on the nymphs. Of these, *Hippodamia convergens* Guer, and the one usually called *Megilla maculata* DeGeer, are the most common.

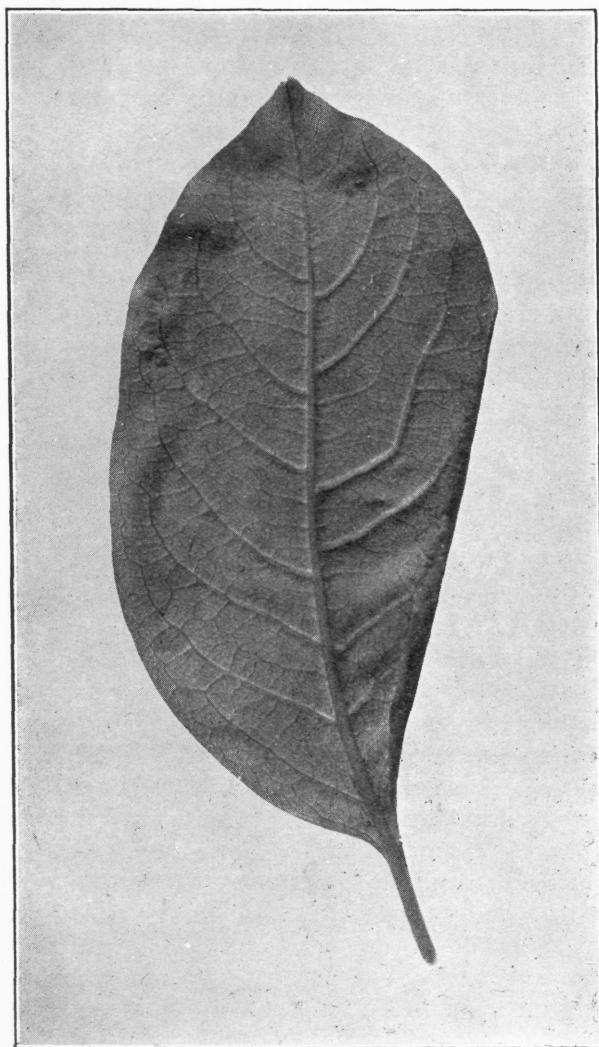


FIGURE 4

Artificial Control.

Only partial control of the persimmon psylla has been secured by using nicotine sulfate sprays because it comes in contact with very few of the nymphs that are protected in the folds of the leaves. Some growers, however, report it as being fairly satisfactory since it kills many of the eggs. The eggs are usually laid on the exposed surfaces. Six percent nicotine sulfate with lime hydrate as a dust and Cyanogas "S" dust (one half calcium cyanide and one-half sulfur) have both given better control of the nymphs and adults in preliminary tests than have sprays of nicotine sulfate.

THE TWIG GIRDLER.

The twig girdler, *Oncideres cingulata* Say, is a severe menace to the pecan industry in many parts of the South because it girdles large numbers of fruited branches before the nuts are ripe. The girdled branches usually break from the tree soon after they are girdled. Even in pecan orchards where the twig girdler is controlled by destroying the girdled branches of the pecan trees which contain eggs or larvæ or both of the pests, the trees may be subject to the attack of the adults, each fall, which have matured from severed branches of near-by native persimmon trees.

When the branches are girdled it results in numerous twigs growing out near the girdled end thus giving a "bunched" effect. This is common on trees of all sizes.

In the experience of the writer, judging from the comparative number of twigs girdled on the several host plants in the Carolinas, the persimmon appears to be the favorite host plant of the pest. Because of this fact, the native persimmon serves as a tremendous reservoir for the twig girdler as a source of infestation for pecan orchards. This makes it necessary to burn the girdled branches of near-by persimmon trees as well as those of the pecan and hickory in the control of this insect. Persimmon trees having no value could be destroyed and this control measure would not have to be repeated each year.

The twig girdler is not abundant and a menace in all areas where either the pecan or the persimmon grow.

OTHER INSECTS.

The San Jose scale is the most common scale of economic importance that occurs on the native persimmon. Infestations are very unusual, however, unless the trees are near orchards, where San Jose scale is common. Heavy infestations and severe damage have been caused by the webworm, identified as the summer brood of *Hyphantria cunea* Drury, during each year in the area under observation.

There are other insects that are common on the native persimmon. Some of these attack no other hosts while others are more or less general in their feeding habits. These will be included in another report.

SUMMARY.

1. The persimmon grows or starts to grow in many habitats in the Carolinas but does not occur in large numbers in any of these after maturity. This is because of the subdominant place it has in relation to other trees.

2. It starts to grow as a shrub or tree, in the margin of alder swamps, in successions after *Andropogon*, *Erigerion*, or *Syntherisma*, as an undergrowth in certain forests, in open and barren fields and in many other places but it is usually shaded out, for the most part, by pine and deciduous trees.

3. The persimmon is a host and reservoir for certain insects of economic importance in the Carolinas.

4. Persimmon psylla nymphs suck the juices from the leaves of both the native and Japanese persimmon and often cause folds and rolls in leaves of the native persimmon, and indentations or pits on the lower surface of the leaves of the Japanese persimmon.

5. Soapy nicotine sulfate solutions gave some control of the egg stage while nicotine sulfate with lime hydrate as a dust and Cyanogas "S" dusting mixture were more effective in the control of nymph and adult stages.

6. Persimmon is a host and the chief reservoir for the twig girdler in many sections where pecans are grown, and thus serves as a menace to this industry. It is an important host of the webworm and is occasionally infested with San Jose scale.